

Chapter Two

Looking at Industry

- **Industry Progress: TRI and Voluntary Programs**
- **Establishing Corporate Commitment to Pollution Prevention**
- **Helping Small Businesses to Undertake Pollution Prevention Measures**
- **Encouraging Industry-wide Initiatives**
- **Reaching Suppliers and Customers**
- **Making the Most of Community Involvement**
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 - Marc J. Epstein, INSEAD**

Introduction

Reducing and preventing industrial pollution has been the primary focus of this nation's pollution prevention agenda over the past decade. Quantifying the progress that industry has made in adopting a pollution prevention approach remains elusive. (See Chapter 7 of this report for a more detailed discussion of Measuring Pollution Prevention.) However, anecdotal evidence suggests that reliance on pollution prevention as a primary environmental management tool is increasing and spreading beyond the initial industry leaders. Still, much work remains to be done. This chapter begins with some thoughts on motivating industry to prevent pollution. Why should industry practice pollution prevention? How can those that influence industry decision makers (governments, customers, suppliers, workers, non-profit groups, communities, etc.) effectively encourage pollution prevention?

In 1995, EPA completed an ambitious project to examine how a pollution prevention ethic could be promoted throughout industry. According to the findings of the Industrial Pollution Prevention Project (IP3), the four most important general motivators for pollution prevention in industry are economics, technical and financial assistance, open communication, and flexibility (especially regulatory flexibility).¹ The IP3 found that the key "trigger" for pollution prevention is a stringent regulation or enforcement action. Research conducted by the non-profit group INFORM on the chemical and paint and adhesives industries similarly found that the desire to avoid being subject to regulations provided the most critical impetus for pollution prevention, not only motivating source reduction initiatives but also ensuring their success in the marketplace.² Similarly, in a 1994 study of global competitiveness in six industries, environmental pressures from regulations and from consumers and professional advocacy campaigns created opportunities for companies to gain competitive advantage in domestic and international markets.³ Such innovations resulted in cost reductions, yield improvements, market share increases, and/or export expansion.

The economic benefits of pollution prevention have proven to be the most compelling argument for business to undertake prevention projects. In a 1992 follow-up study of 29 firms originally examined in 1985, INFORM found a heightened level of awareness and activity related to pollution prevention. Nearly half of the companies were saving between \$45,000 and \$1 million annually on their source reduction activities, with 15 percent saving \$1 million or more. Payback periods were short; in nearly two-thirds of the source reduction activities, companies recouped their investments in 6 months or less.⁴

¹ EPA, *Industrial Pollution Prevention: Incentives and Disincentives* (EPA-820-R-94-004, August 1994). Also see: EPA, *Industrial Pollution Prevention Project (IP3): Summary Report* (EPA-820-R-95-007, July 1995).

² INFORM, *Stirring Up Innovation: Environmental Improvements in Paints and Adhesives* (New York, NY, 1994).

³ Management Institute for Environment and Business, *Competitive Implications of Environmental Regulations: A Study of Six Industries* (Washington, DC, 1994).

⁴ Dorfman, Mark H., Warren R. Muir, and Catherine G. Miller, *Environmental Dividends: Cutting More Chemical Wastes* (INFORM, 1992).

The four most compelling motivators for pollution prevention in industry are:

- economics
- technical and financial assistance
- open communications
- flexibility (especially regulatory flexibility)

Cost savings from prevention come not only from avoiding environmental costs like hazardous waste disposal fees, but also from avoiding costs that are often more challenging to count, like those resulting from injuries to workers and ensuing losses in productivity. In that sense, prevention is not only an environmental activity, but also a tool to promote worker safety.

So, if preventing pollution is so good for the bottom line, why don't companies always do what's good for them? One answer might be that managers don't always realize the benefits that prevention would bring to their own firms. "Environmental accounting" — a new type of managerial accounting that helps firms identify environmental costs and benefits — is just now beginning to take hold and to demonstrate to companies how much of their costs are attributable to environmental activities.⁵

The basic idea of environmental accounting is that an organization's environmental costs, like all its costs, need to be identified, quantified, and allocated to the process or product that incurs them in order for such costs to be managed and reduced. If companies pay closer attention to the size and causes of their environmental costs, they will have an economic incentive to prevent them from occurring in the first place. Fewer than 10 percent of U.S. manufacturing firms routinely allocate environmental costs to the responsible product or process in their internal accounting systems, according to a 1995 survey of 150 firms.⁶ Another study that closely examined the accounting systems of nine industrial firms found that "the environmental costs teased out of hiding turned out to be colossal."⁷

Similarly, pollution prevention can offer companies exciting opportunities to increase market share, but only if managers have the foresight to realize these opportunities and if their firms are well-positioned in the industry. Michael Porter of Harvard University and Claas van der Linde of St. Gallen University in Switzerland have developed a dynamic model of competitive business behavior showing that market share can be captured by companies that continually innovate.⁸ But, as Porter and Linde advise, "companies must begin to recognize the environment as a creative opportunity rather than as a costly threat." Large companies in industries with a high rate of change (e.g., computer and chip manufacturers) tend to have the most resources for innova-

⁵ See EPA chapter of this report for a description of EPA's Environmental Accounting project. A bibliography of sources for companies that have realized pollution prevention opportunities by using environmental accounting tools, in addition to complete case studies from AT&T and Ontario Hydro, are available through EPA's Pollution Prevention Information Clearinghouse at 202-260-1023.

⁶ Tellus Institute, *Environmental Cost Accounting for Capital Budgeting: A Benchmark Survey of Management Accountants* (1995).

⁷ World Resources Institute, *Green Ledgers: Case Studies in Corporate Environmental Accounting* (1995). The study examined the books of Du Pont, Amoco, Ciba-Geigy, S.C. Johnson, Dow Chemical, and three small firms in the Pacific Northwest. In the case of one Du Pont plant studied, environmental costs made up 19 percent of the total cost of manufacturing an agricultural pesticide. At an Amoco facility, aggregate environmental costs were estimated at nearly 22 percent of operating costs.

⁸ Michael E. Porter and Claas van der Linde, "Green and Competitive: Ending the Stalemate," *Harvard Business Review* (September/October 1995).

tion. On the other hand, some industries cannot meet the challenge, particularly if they are made up of small companies that are required to make large fixed investments.⁹

Companies are often stymied by the up-front costs that pollution prevention appears to require. According to the findings of the IP3, “while pollution prevention measures can hold the promise of future cost savings, if capital investment is needed for such changes, companies... can find themselves in a Catch-22 situation.”¹⁰ Nevertheless, relatively few companies have reached the point where only capital-intensive measures are available. A 1992 INFORM report examined pollution prevention activities at a variety of facilities in the organic chemical industry and found that no capital investment was required for one quarter of the 48 source reduction activities; investments of under \$100,000 were required for about half the activities.¹¹ In addition, over the past 5 years, loan and grant programs have become more readily available to assist companies interested in investing in pollution prevention.

This chapter begins with an overview of industrial pollution prevention progress demonstrated through two prominent EPA initiatives — the required reporting of toxic releases to EPA’s Toxics Release Inventory (TRI) and EPA’s voluntary partnership programs, known collectively as “Partners for the Environment.” The remainder of this chapter reviews different approaches to industrial pollution prevention and some of the lessons that have been learned over the past six years in promoting a pollution prevention ethic.

The examples in this chapter are drawn from a wide variety of industries. While most industrial pollution prevention reports tend to focus on the chemical and manufacturing sectors, for this report, we have drawn from a wider range of industries — from retail stores to utilities to agriculture — to highlight opportunities to prevent pollution across the board. However, it would be impossible to cite all of the companies that have achieved impressive pollution prevention successes. The specific examples described here are illustrative of diverse approaches to prevention.

Industry Progress: TRI and Voluntary Programs

The clearest measure of industrial pollution in the manufacturing sector can be found in companies’ annual reports of environmental releases of toxic chemicals to TRI. Correspondingly, one of the clearest indicators of corporate responsiveness to the need for reducing chemical releases and preventing pollution has been a company’s participation in EPA’s voluntary programs.

⁹ Management Institute for Environment and Business, *Competitive Implications*, cited in EPA, *Pollution Prevention News* (March-April 1995) pp. 4-5.

¹⁰ EPA, Office of Water, *Industrial Pollution Prevention: Incentives and Disincentives* (EPA 820-R-94004, August 1994). p.2.

¹¹ Dorfman, Mark H., Warren R. Muir, and Catherine G. Miller, *Environmental Dividends: Cutting More Chemical Wastes* (INFORM, 1992).

TRI Data

The TRI data¹² collected and published annually demonstrate a steady decline in the volume of toxic chemicals released to the environment by the manufacturing sector. However, over the last several years, the total amount of wastes generated has been rising. TRI data for 1995 show a decline of 4.9 percent in releases of core chemicals reported in both 1994 and 1995. Overall, from the baseline year of 1988 until 1995, total releases (for chemicals reported in each of the years) decreased by 1.35 billion pounds, a 45.6 percent decline. However, total production-related waste generated in 1995 from all TRI chemicals was over 35 billion pounds, a 6.8 percent increase since 1991.

Companies report pollution prevention activities to the TRI, as required under the Pollution Prevention Act of 1990. Of the 21,951 facilities reporting to TRI for 1995, nearly 29 percent claimed to have undertaken at least one source reduction activity. This is down from 32 percent in 1994. Most commonly reported were “good operating practices” followed by process modifications, and spill and leak prevention. In general, facilities project little change in how they expect to handle their waste in the next several years.

Individual industries have had very different experiences with TRI chemical releases and reductions. As Table 2-1 shows, several industries reported reductions of half or more of total releases since 1988, led by the electrical equipment industry (79.7 percent) and leather goods manufacturers (77.8 percent). In 1995, the chemical manufacturing industry continued to rank in first place with the largest amount of chemicals released (36 percent of total releases), followed by the primary metals industry (15 percent), paper (11 percent), and plastics (5 percent).

The top 10 chemicals released into the environment (shown in Table 2-2) account for over half the total amount of releases of the expanded list of 643 TRI chemicals. The 10 companies that reported the highest total releases of toxic chemicals in 1994 are shown in Table 2-3. Although these firms represented fewer than 2 percent of all TRI reporting facilities, they accounted for 26 percent of total TRI releases in 1994.

It is important to note that the volume of TRI chemicals released does not necessarily equate to the amount of risk posed to the public. TRI reports reflect release of chemicals, not exposure of the public to those chemicals. Because health risk is dependent not only on toxicity but also on exposure, release estimates alone are not sufficient to calculate adverse effects on human health and the environment.

¹² For more information on the 1995 TRI data, see: EPA, *1995 Toxics Release Inventory: Public Data Release* (EPA 745-R-97-005, April 1997).

Table 2-1. TRI Releases by Industry

Industry	Percentage Change in Releases, 1988-1995	Total Releases, 1995 (millions of pounds)
Electrical Equipment	-79.7%	30.5
Leather	-77.8%	3.1
Measurement/Photography	-74.2%	16.9
Tobacco	-72.2%	1.7
Machinery	-67.6%	23.2
Textiles	-56.1%	17.8
Chemicals	-49.8%	787.7
Printing	-48.3%	31.6
Stone/Clay/Glass	-47.1%	36.0
Transportation	-44.4%	110.0
Petroleum	-40.6%	59.9
Fabricated Metals	-40.1%	82.6
Primary Metals	-38.2%	331.2
Furniture	-33.7%	41.0
Plastics	-31.1%	112.2
Food	-27.5%	86.0
Paper	-12.6%	233.2
Lumber	- 5.0%	31.3
Apparel	+33.6%	1.3

Source: EPA, 1995 Toxics Release Inventory: Public Data Release (EPA 745-R-97-005, April 1997), Tables 4-10, 5-5.

Table 2-2. Top 10 Chemicals Released/Disposed, 1995

Chemical	Number of Pounds (millions)
Methanol	245.0
Ammonia	195.1
Toluene	145.9
Nitrate compounds	137.7
Xylene (mixed isomers)	95.7
Zinc compounds	87.6
Hydrochloric acid	85.3
Carbon disulfide	84.2
n-Hexane	77.4
Methyl ethyl ketone	70.0
Total for top 10 chemicals	1,224.1
Total for all TRI chemicals	2,208.7

Source: EPA, 1995 Toxics Release Inventory: Public Data Release, Overview (EPA 745-R-97-005, April 1997), Table 6.

Table 2-3. Top 10 Companies Based on Total Releases Reported to TRI, 1994

Company	Total Facilities	Releases (millions of pounds)
Du Pont	70	203.6
ASARCO Inc.	11	69.4
Renco Group Inc.	12	66.1
IMC Global Inc.	13	47.7
International Paper Co.	71	43.1
General Motors Corp.	112	36.8
Courtaulds United States Inc.	9	34.5
Monsanto Co.	27	27.4
Arcadian Partners LP	8	26.4
Georgia-Pacific Corp.	90	26.2
Total for top 10 companies	423	581.2
Total for all TRI facilities	22,744	2,260.2

Source: EPA, 1994 Toxics Release Inventory: Public Data Release, Executive Summary (EPA 745-S-96-001, June 1996), Table E-1.

"When EPA proposed the 33/50 Program, we recognized that its general objective was no different than ours."

—Aristech Chemical

Partners for the Environment

EPA has been developing and aggressively promoting voluntary partnerships as an alternative to the traditional command-and-control regulatory approach. Programs such as Green Lights, the 33/50 Program, WasteWis\$e, Climate Wise, and WAVE

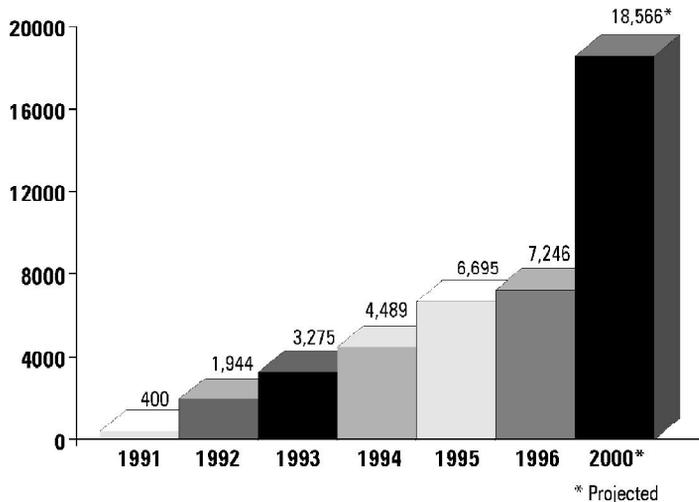
challenge businesses to prevent pollution and improve their company's bottom line. Collectively, these partnership programs are known as Partners for the Environment, and they are producing impressive results. As noted in Chapter 1, in 1995, over 6,000 participants saved \$435 million while helping to cut toxic pollution, reduce solid waste, and lower greenhouse gas emissions.

Why Do Industries Join EPA's Voluntary Programs?

Industry participation in the 33/50 Program has proven remarkably successful and is responsible for an accelerated reduction in the 17 chemicals targeted by the program. The 1,300 corporate participants in the 33/50 Program own more than a quarter of the total number of TRI facilities, and were able to meet the program's 1995 goal of 50 percent reduction a year ahead of schedule. Participants in 33/50 applauded the program's flexibility and voluntary, "no-strings-attached" terms. An interesting insight offered by Aristech Chemical in reflecting on the success of the 33/50 Program is that the program greatly improved government/industry relations: "When EPA proposed the 33/50 Program, we recognized that its general objective was no different than ours. Therein lies a major reason for the success of the program. The progress realized under 33/50 typifies the success that can be achieved when government and industry work in pursuit of mutually agreed upon objectives."¹³

¹³ "The Smart Choice," *Environmental Champions*, a supplement to *Chemical Engineering and Environmental Engineering World*, undated, p. 16.

Figure 2-1. Participation in *Partners for the Environment* Continues to Increase



Interest in these programs continues to grow – participation increased by 25 percent in the last year alone (Figure 2-1). EPA now projects that by the year 2000, the number of partners will nearly triple and the total savings to firms will approach \$7 billion a year.

Establishing Corporate Commitment to Pollution Prevention

A 1993 study by the Business Roundtable, an association of business executives, confirms what many believe — successful corporate pollution prevention programs begin with tangible forms of corporate commitment.¹⁴ The goal of the Roundtable’s “benchmarking” study was to determine the common, as well as the unique, elements of six “Best-In-Class” manufacturing facilities: Proctor & Gamble’s Mehoopany, PA facility; Intel in Aloha, OR; Du Pont in La Porte, TX; Monsanto in Pensacola, FL; 3M in Columbia, MO; and Martin Marietta in Waterton, CO.

Key findings of the study included:

- All facilities had strong management support and a focal point for the facility level pollution prevention program.
- Successful facilities understood their corporate and plant cultures and implemented their pollution prevention programs in a way that worked within those cultures.

¹⁴ The Business Roundtable. *Facility Level Pollution Prevention Benchmarking Study* (November 1993).

Corporations can be threatened by their substantial emissions to the environment or challenged by them. They can be stymied by long-standing environmental disputes or motivated to solve them. They can be defensive about existing operations or open to ideas for change. The decisions they make at these crossroads define the role they will play in environmental decision making, as well as their corporate image.

-- Linda Greer,
Natural Resources
Defense Council
(Quoted in Monsanto's
*Environmental Annual
Review*, 1995.)

- The majority of the facilities stated that the corporate role should be to establish corporate goals with facility input, develop and deploy pollution prevention technology transfer across the company, and forecast future compliance issues.
- Facilities were successful when they were *not* told how to approach pollution prevention by corporate environmental groups or other outside forces. The freedom to choose the best pollution prevention method for their organization was key to success.
- Facilities had the ability to report progress against selected goals or initiatives on a monthly or quarterly basis.
- To be able to sustain a pollution prevention program, the projects were, on the whole, cost effective. Unlike compliance projects, pollution prevention projects generally had to compete against capital improvement projects.
- Each facility measured the success of its program differently, using a combination of reduced cost, reduced volume, improved public image, results against goals, ability to expand a facility, and other measures.
- Some facilities normalized waste volume to production; others did not. Each facility used a different method for tracking wastes/emissions. All facilities used PC-based systems to track waste streams and customized spreadsheet packages to meet their own needs.
- Each of the facilities had matured from focusing on pollution prevention within current manufacturing processes to integrating pollution prevention in the pre-manufacturing decision phases. The benchmark facilities were working with raw material suppliers, equipment suppliers, and customers to prevent pollution at each step.

The following summaries of pollution prevention programs illustrate how pollution prevention has been incorporated into five large corporations. Monsanto instituted the Monsanto Pledge, a highly effective statement of principles and commitment which has been backed up by competitions, awards, and other motivational elements. Union Carbide has been recognized by EPA's Office of Pollution Prevention and Toxics for innovative chemical design. Public Service Electric and Gas (PSE&G) provides an interesting example of how materials management decisions can yield pollution prevention returns, and how a company can engage in the successful marketing of by-product materials. AT&T has made innovative use of environmental accounting methods to further its pollution prevention goals. And Home Depot is one of the most active retailers promoting a pollution prevention agenda among its clients and staff.

Monsanto

Monsanto is a major manufacturer of high performance chemicals, high-value agricultural products, industrial process control equipment, food ingredients, and pharmaceuticals. In March 1996, Vice President Al Gore and members of the President’s Council on Sustainable Development presented Monsanto with the Presidential Award for Sustainable Development for its work in pioneering sustainable technologies.

During the 1990-1994 time period, Monsanto achieved a 55 percent reduction in TRI chemicals. In making this

reduction, Monsanto prioritized source reduction with the specific goal of not transferring pollutants cross-media. Monsanto faced this challenge when considering two wastewater projects. Although the projects would have reduced TRI chemical output, they would have increased levels of other wastes not included in the TRI list. The company felt that following this strategy would simply be pollutant transfer, not pollution prevention, and opted not to undertake the projects. In the future, the company plans to continue focusing much of its efforts towards sustainability and, consequently, further reduce TRI emissions.¹⁵

To achieve the 55 percent reduction, Monsanto completed more than 250 projects that involved developing innovative new manufacturing technology and modifying processes; phasing out inefficient operations; applying new pollution controls; and using waste materials for recycling, reuse, and energy recovery. Specific pollution prevention accomplishments include the following:

- Teams from several Monsanto facilities developed a new process to make 4-aminosiphenylamine, an ingredient that makes rubber products more durable. The new patented process called PPD-2 reduced raw material needs by 58 percent and cut organic and inorganic waste by a combined total of 95 percent.¹⁶

The Monsanto Pledge

The Monsanto Pledge — seven principles that describe the company’s vision for a sustainable environment — was unveiled during a speech in 1990 by then Chairman and Chief Executive Officer Richard J. Mahoney at a meeting of the National Wildlife Federation.

- Reduce all toxic and hazardous releases and emissions, working toward an ultimate goal of zero effect.
- Ensure no Monsanto operation poses any undue risk to our employees and our communities.
- Work to achieve sustainable agriculture through new technology and practices.
- Ensure groundwater safety.
- Keep plants open to our communities and involve the community in plant operations.
- Manage all corporate real estate, including plant sites, to benefit nature.
- Search worldwide for technology to reduce and eliminate waste from our operations, with the top priority being not making it in the first place.

¹⁵ Conversation with Dennis Redington of Monsanto on September 6, 1996. For further information, he can be contacted at 314/694-6503.

¹⁶ Monsanto. *Monsanto’s 90 Percent Air Emissions Reduction Program*.

- Monsanto switched from a well-established process using extremely hazardous substances including formaldehyde, ammonia and cyanide-based chemicals to a new, highly innovative process that eliminates these hazardous substances from the manufacture of the pesticide Roundup®, replacing them with more benign chemicals. This new process is saving the company \$4 million a year that used to be spent managing more than 5 million pounds of waste. In July of 1996, EPA presented a “Green Chemistry Challenge” Award to Monsanto for this achievement.¹⁷
- The Monsanto Butvar resin facility in Antwerp, Belgium, redesigned its facility to save energy, reduce water usage, and cut back effluent. Butvar is a material used in the plastic innerlayer of safety glass in automobiles and in certain paints and adhesives. The first part of the project captures heat from the hot water system overflow and uses it in the manufacturing process. The cooled overflow is used to replenish water lost in the system. The result is a reduction of effluent to the Antwerp treatment plant of 16 tons per hour. The second part of the project involves saving and re-using wash water several times in different parts of the manufacturing process. Monsanto estimates that it saves more than \$400,000 a year in water and energy use as a result of this new process.¹⁸

Union Carbide

OPPT’s New Chemicals Pollution Prevention Recognition Project recognized the Union Carbide Corporation for developing an innovative surfactant, or detergent, for use in industrial settings.¹⁹ The material can be split prior to environmental release, which results in two non-polluting fragments or byproducts. Union Carbide developed the new surfactant to meet its industrial laundry and metalworking customers’ needs for a product that would satisfy the effluent composition limits of publicly owned treatment works (POTWs). This new technology reduces biological oxygen demand (BOD) and fats, oils, and grease (FOG) in effluents. Other prevention benefits of this new material include: generating less solid waste; generating solid waste that is higher in organic content and, therefore, can be put to a more beneficial use as fuel; and reducing the use and discharge of phosphates.

Public Service Electric and Gas

PSE&G is the fourth largest combination electric and gas utility in the nation, serving 2.2 million electric and gas customers over a 2,600 square-mile service territory in New Jersey. PSE&G’s vast size and diversified power generation and service

¹⁷ EPA Press Advisory (July 12, 1996) and personal conversation with Larry O’Neill, Monsanto, (December 4, 1996).

¹⁸ Monsanto. “Butvar™Solvent and Butvar™RB Utility Usage Reduction,” *Monsanto Backgrounder*, (1995).

¹⁹ For more information about OPPT’s New Chemicals Pollution Prevention Recognition Project, contact Ken Moss (202-260-3395) or Roy Seidenstein (202-260-2252) of EPA/OPPT.

activities require substantial materials support, the costs of which increased sharply during the 1980s.

In 1990, in the face of escalating material costs, PSE&G formed a senior-level Materials Management Study Team to develop innovative strategies to reform its material management process to control costs, improve service to internal customers, and realize environmental benefits. This effort led to a wholesale paradigm shift in PSE&G's approach to materials management. For example, instead of managing materials under the old-fashioned notion of "just-in-case" (i.e., purchasing and maintaining surplus supplies to meet any unanticipated future needs), PSE&G's new approach is founded on a "just-in-time" concept (i.e., purchasing and stocking only that amount of material necessary to satisfy planned needs in the immediate future). Similarly, instead of viewing used or surplus materials as wastes (and liabilities), PSE&G's new strategy emphasizes that such materials are potential resources (and assets).

At the same time as the company changed its materials management system, it also focused immediate increased attention on recycling and source reduction, setting goals of reducing by 30 percent the total amount of hazardous waste PSE&G generates, and recycling 75 percent of all non-hazardous solid wastes. PSE&G was honored as a 1996 WasteWi\$e Program Champion for its Comprehensive Waste Reduction Program. The company surpassed these 1995 goals a year early — it reduced hazardous waste generation by 43 percent and recycled 94.5 percent of all company-generated non-hazardous solid waste. This percentage for non-hazardous solid waste includes coal combustion by-products (principally coal ash) generated by the company, all of which it successfully marketed (e.g., cement/concrete admixture, flowable fill, structural fill, pavement base, asphalt filler, cement kiln feedstock, anti-skid road grit, blasting and surface prep products, and as a landfill cover). PSE&G estimates that it saves \$19-24 million annually as a result of its new materials management system. The company attributes most of this savings to a decrease in the operations and maintenance cost of maintaining an extensive inventory and increased procurement leverage.²⁰

AT&T

Changing the accounting systems of an industry giant such as AT&T²¹ is by no means an overnight operation. AT&T began to develop such a change in 1993, when it named Brad Allenby as Research Vice President for Technology and Environment, and set up a Design for the Environment Coordinating Team, one of whose projects was "green accounting."

We do not see a need to choose between good environmental practice and good business operations. Rather, we believe in a Shared Vision — that a cleaner, healthier environment can, indeed, should go hand in hand with a strong economy and the highest standard of living and quality of life in the world.

-- James Ferland,
Chairman and Chief
Executive Officer and
Lawrence Codey,
President and Chief
Operating Officer,
Public Service Electric
and Gas ("Our
Commitment to the
Earth," January 1993).

²⁰ Public Service Electric and Gas Company. *Initial XL Proposal of Public Service Electric and Gas* (December 1995).

²¹ EPA "Environmental Accounting Case Studies: "Green Accounting at AT&T." (EPA 742-R-95-003, September 1995).

Recognizing that green accounting must involve a number of traditionally separate perspectives and functions, AT&T management saw a multi-functional team approach as the only viable planning option. Over time, the initial nine-member team expanded to include members representing supply line management, design engineering, process engineering, environmental engineering, cost accounting, and financial policies nationwide and overseas. Team meetings took place every month, gradually shifting to one meeting every 6 to 8 weeks.

Among the early challenges faced by the Green Accounting Team were the issues of terminology and language, and the need for a baseline. For example, should green accounting include both “private costs” (costs that impact a firm’s bottom line) and “societal costs” or externalities (the impacts of pollution on society and the environment)? The team recommended that AT&T define green accounting, for now, in terms of private costs and also proceeded to develop a glossary for the many terms specific to environmental accounting.²² In addition, the team felt that given the variability within the company in treating overhead costs, AT&T must set a baseline of current practices to help target opportunities.

The green accounting team also embraced AT&T’s use of the principles of activity-based costing (ABC) and activity-based management (ABM). ABC is a method for assigning relevant costs to products by identifying the resources consumed by activities performed for these products (e.g., a telephone, computer, etc.). But, since “tracking costs alone does not drive improvements,” AT&T also uses ABM to determine the “causes” or “drivers” of activities and their costs — placing the focus on such areas as product or process design, supplier qualification, etc.

In order to develop baseline information, the team developed a self-assessment tool that AT&T plants could use as an aid in establishing baselines and goals for improvement. The self-assessment tool includes a status survey to raise awareness of how decisions are currently made, what information is used, and whether environmental activities are reflected in product and process costing; and a green activities/resources matrix, which requires the user to identify what information is important.

Three sites reviewed the self-assessment tool, providing feedback on its usefulness and suggestions for further refinements. As of June 1995, the Green Accounting Team had identified an ambitious agenda of future projects, including bringing environmental cost considerations into play for any future plant start-ups and divestitures, and tying in with the Green Index, an AT&T software tool being developed to assist designers in scoring the environmental attributes of a product.

Home Depot

Home Depot,²³ one of the nation’s largest home improvement retailers, helped pioneer the first U.S. private sector program to partner retailers, manufacturers, and

²² Few companies outside of the utility sector in North America have moved to incorporate externalities into their accounting systems.

²³ Source for this section is Home Depot’s Web page on the Internet at <http://www.homedepot.com>.

third-party environmental certification to promote continuous environmental improvement in consumer products.

Home Depot's efforts go back a number of years. In 1991, Home Depot published its Environmental Principles, subsequently adopted by the National Retail Hardware Association and Home Center Institute, representing over 46,000 U.S. retail hardware stores and home centers. The company started using recycled content materials for store and office supplies, advertising, signage, and shopping bags, and established an evaluation process for suppliers making environmental marketing claims on product labels. A year later, Home Depot discontinued sale of lead plumbing solder, and published its first version of *Environmental Greenprint*[®], which pinpoints 88 ways to bring about a “greener” home in making home improvements. Home Depot also began a program to recycle gypsum wallboard shipping packaging, with the goal of eliminating an additional 10 percent of all solid waste. The program became the first reverse distribution effort in the hardware industry, as material was returned to the store for return to the manufacturers.

By 1993, Home Depot stores were featuring permanent banners on their front walls, pledging commitment to continually improve environmental performance, community involvement, and social responsibility. The first of many Recycling Depots was opened on a one-acre site next to the Duluth, Georgia store, integrating shopping with a drive-thru recycling center. Another first was the “Environmental Report Card,” which offered consumers a comprehensive disclosure of a product's environmental impacts on its label, based on the findings of a “cradle-to-grave” life-cycle assessment of the product.

In 1994, Home Depot became the first home center to offer both tropical and temperate region wood products from forests independently certified as “Well-Managed” under Scientific Certification System's Forest Conservation Program. Home Depot led the industry in the changeover of interior doors to simulated wood from tropical rainforest wood. The company also implemented a program to replace all wood shipping pallets with returnable and reusable “slip sheets,” with the goal of minimizing solid waste and reducing energy used in transportation and consumption of hardwood resources used to make wood pallets.

Home Depot's environmental efforts were recognized in March 1995 with the President's Sustainable Development Award, which noted that “by disseminating accurate consumer information through eco-labeling, the program has built support for more sustainable product design and production policies.”

Helping Small Businesses to Undertake Pollution Prevention Measures

The dynamics of preventing pollution can be different for small business compared to large businesses. With managers closer to day-to-day operations, pollution prevention opportunities may be easier to identify in small businesses. On the other hand,

Table 2-4. Technical Assistance and Business Development Programs***EPA's Small Business Ombudsman***

EPA's Small Business Ombudsman assists small businesses in complying with environmental regulations. Contact Karen V. Brown, 800-368-5888 with questions or concerns. The Small Business Ombudsman's Office also coordinates a network of state small business ombudsmen.

NIST's Manufacturing Extension Partnership

The National Institute of Standards and Technology (NIST) established the Manufacturing Extension Partnership (MEP) to increase the global competitiveness of smaller manufacturers. For general information, contact MEP at 301-975-5020. (See Chapter 3, Other Federal Agencies).

SBA's Small Business Development Centers

The U.S. Small Business Administration (SBA) supports 57 state and territorial Small Business Development Centers (SBDCs), along with over 900 sub-centers, to provide management and technical assistance to small businesses. EPA and SBA are developing a coordinated offering of business development and pollution prevention technical assistance services through five pilot SBDC projects (in Iowa, Texas, Vermont, Virginia, and Wisconsin). To locate the nearest SBDC, contact the Association of Small Business Development Centers at 703-448-6124.

State Technical Assistance Programs

Every state has a small business assistance program which, at a minimum, aids small businesses impacted by air quality regulations, as required by the Federal CAA. These programs are coordinated nationally from EPA's offices in Research Triangle Park, North Carolina (919-541-0800). EPA also supports a broader role of state technical assistance programs through the Pollution Prevention Incentives for States program mandated by the Pollution Prevention Act.

EPA's Small Business Compliance Assistance Centers

EPA recently established national Compliance Assistance Centers to provide "one-stop shopping" for information about complying with environmental regulations. Each Compliance Assistance Center provides some or all of the following services via the Internet and toll-free telephone: easy access to federal regulations, interpretations, and guidance; compliance tools and process-specific training; information exchange through "chat rooms" and conferences; and databases of technologies and pollution prevention ideas. Currently, there are four Compliance Assistance Centers covering agriculture, metal finishing, printing, and the automotive service industry. Four more are on the way, in the areas of transportation, local governments, small chemical manufacturers, and printed wiring board manufacturers. The existing centers can be reached at: printing — <http://www.pneac.org>; automotive — 1-888-GRN-LINK (476-5465) or <http://www.ccar-greenlink.org>; agriculture: <http://www.es.inel.gov/oeca/ag/aghmpg.html>; metal finishing — 1-800-AT-NMFRC or <http://www.nmfrc.org>. For general information, contact EPA's Office of Compliance at 202-564-2280.

very small businesses generally have few in-house technical resources and may have financial challenges to overcome, such as small capital budgets and difficulty obtaining credit.

Over the past several years, a patchwork of state and local government and not-for-profit financial assistance programs, which target environmental compliance and/or pollution prevention activities, primarily by small businesses, has emerged (see Table 2-4).²⁴ This proliferation seems to indicate that financing is the primary challenge small businesses face in implementing pollution prevention. A recent pilot project carried out for EPA by the Maryland Department of the Environment, however, suggests that financing is only one of a number of factors that influence pollution prevention decisions by small businesses.

The pilot project, which was designed to assess whether small businesses are able to obtain credit for capital investments in pollution prevention, focused on 800 dry cleaners, 77 of which were required to retrofit their machines or purchase new ones in order to comply with a federal air toxics rule. The cost of the retrofit was estimated in the rule at \$6,300, but due to the sudden increase in demand, the cost escalated to \$15,000 within two months of publication of the rule.

Contrary to expectations, the banks contacted as part of the project *were* interested in potential revenue associated with purchase of the new equipment, and were *not* concerned with environmental liabilities associated with the dry cleaning industry. Despite the small size of the loans, the banks were willing to make the loans as long as an intermediary organization (in this case, Maryland’s Small Business Development Center [SBDC]) had analyzed the financial status of these businesses and could show that each would be able to meet the loan payments. One of the project’s conclusions, however, was that merely having a financial assistance program available does not ensure that it will be used. The Maryland companies that ultimately took advantage of the assistance available did so only after an active outreach program identified and encouraged them to pursue the opportunities.²⁵

Some small businesses are successful in implementing pollution prevention measures, saving money or building markets along the way. Here are five examples:

²⁴This is not an exhaustive list of technical assistance programs for small businesses. Readers interested in pursuing this are encouraged to refer to EPA’s *Pollution Prevention Directory*, available through the Pollution Prevention Information Clearinghouse at 202-260-1023.

²⁵ For more information, contact Liz Taddeo, Maryland Department of the Environment, 410-631-4119, or Ed Weiler, EPA, 202-260-2996. Two related reports are: (1) Perkins, S.P., T. Goldberg, and E. Weiler. “Myths and Realities of P2 Financing,” *Pollution Prevention Review* (VII:2, Spring 1997) and (2) Great Lakes Environmental Finance Center. *An Inventory and Assessment of Pollution Control and Prevention Financing Programs (Draft)* (February 1997). Contact Ms. Ziona Austrian at 216-687-3988.

Ocean State Power (Burrillville, Rhode Island)

Ocean State Power was selected as a pilot project in EPA's Environmental Leadership Program.²⁶ This facility, which employs 100 people, is a 500 megawatt, natural gas-fired, combined cycle electric generation facility located in rural Burrillville, Rhode Island. It was the first power plant in New England to use natural gas as its primary fuel. The state-of-the-art facility was designed with pollution prevention in mind. Ocean State Power has made significant progress on two waste reduction activities:

- Eliminating the oil waste created from test firing. The plant performs test oil firing on the turbines for 15 minutes each week. If ignition does not occur within the programmed time, the unit automatically shuts down and the oil has to be purged from the system to allow for a clean refiring. In the past, the plant disposed of this oil as waste. It now recycles the oil back into the oil tank for reuse.
- Reviewing a method to eliminate ammonia waste. The trucks that deliver ammonia to the plant do not have a method to capture the liquid remaining in the truck's hose after a delivery. Currently, several gallons of ammonia are collected and disposed of as waste product. Ocean State Power is evaluating a system to pump this product into the on-site ammonia tank, thus eliminating the waste.

Ecoprint (Silver Spring, Maryland)

Ecoprint is a printer based in Silver Spring, Maryland, with fewer than 10 employees. Ecoprint's clientele includes associations, environmental groups, and nonprofit organizations from the greater Washington, DC area. The emphasis of their work is on newsletters, other publications, brochures, and some short-run direct mail.²⁷ Ecoprint has become recognized by its industry colleagues and others as a leader in environmentally responsible printing. Going beyond compliance with environmental laws, Ecoprint has spent years doing research with ink manufacturers and paper mills to produce new products and processes that create a higher standard of environmental excellence. Some of its pollution prevention achievements include the following:

- Developed sheetfed offset printing inks based on non-heavy metal pigments. New non-heavy metal inks, developed by Alden & Ott Inks, were formulated from a soybean oil, non-petroleum base. This was done through a 1992 \$25,000 EPA pollution prevention grant.
- Worked with Cross Pointe Paper Company to test a chlorine-free sheet combined with 20 percent post-consumer waste content. The new sheet was so successful that Cross Pointe invested the resources to make it a new product line.

²⁶ For more information on the Environmental Leadership Program, see Chapter 1 of this report.

²⁷ Ecoprint. *Environmental Initiatives Fact Sheet*.

- Eliminated alcohol and alcohol substitutes in press wetting agents. A compound based on non-toxic citric acid and gum arabic is now used in place of the alcohol.

Frost Paint and Oil (Minneapolis, Minnesota)

Frost Paint and Oil, which employs 35 people, is a manufacturer of industrial paints and linseed oil-based varnishes.²⁸ A few years ago, Frost Paint and Oil reviewed its waste streams, including paint sludge, varnish oil sludge, process water, and non-hazardous solid waste, and established a goal of reducing them 10 to 15 percent a year for 3 to 5 years. This goal was set in accordance with the Minnesota 50 Project, a voluntary pollution prevention program modelled after EPA's 33/50 Program that Frost Paint and Oil had joined. After evaluating a number of options for reducing waste, the company decided that the quickest and least expensive way to reduce waste generation was to implement an employee incentive program. The employees were motivated by the promise that two-thirds of any resulting savings would be passed on to them. As a result of the employee incentive program, Frost Paint and Oil reached its Minnesota 50 Project goal in one year. The innovative approach reduced hazardous waste by 55 percent and saved the company \$25,000 in 1992. In 1993, the employee incentive program resulted in a further reduction in hazardous waste generation of 22 percent. During these years of dramatic waste reduction, Frost Paint and Oil's production rate remained fairly constant.

Nachi Technology, Inc. (Greenwood, Indiana)

Nachi Technology employs 80 people in manufacturing precision ball bearings for the automotive industry.²⁹ To prepare the bearings for further processing, they must be cleaned to remove any contaminants. Nachi replaced its 1,1,1-trichloroethane-based cleaning system with machines that use centrifugal force to remove the contaminants; this project was not merely a solvent substitution, but a solvent elimination. The mechanical cleaning machines eliminated 1,1,1-trichloroethane from this and all other manufacturing processes, which will benefit Nachi employees and the environment for years to come. Nachi Technology received two Indianan Governor's Awards in 1996: one pollution prevention award for the solvent elimination and one recycling award for reducing and reusing packaging materials.

Genencor (Rochester, New York)

Genencor is a company with 1,200 employees that supplies enzymes and other biochemicals to industries. Genencor developed an environmentally friendly pro-

²⁸ Most of the activity in this waste reduction program was undertaken a few years ago. The company has since acquired another small paint company and has been renamed "Davis Frost." In total, the new company has slightly less than 100 employees.

²⁹ State of Indiana List of 1996 Governor's Awards for Excellence in Pollution Prevention. Indiana Department of Environmental Management, 317-232-8603.

cess for manufacturing indigo dye, which is used to color blue jeans among other things, using biotechnology. Genencor's process uses an intergeneric microorganism, glucose, and other microbial nutrients instead of hazardous reagents like aniline, formaldehyde, and hydrocyanic acid. Eliminating the use of such hazardous chemical feedstocks reduces exposures, releases, and risks traditionally associated with the manufacturing process. Genencor was recognized by OPPT's New Chemicals Pollution Prevention Recognition Project for this innovative work.³⁰

Encouraging Industry-Wide Initiatives

A positive step forward in encouraging industry initiatives in recent years has been the development of industry-wide pollution prevention programs by professional and trade associations. Such programs institutionalize the ethic of pollution prevention, disseminate information on an ongoing basis, and help spur individual company members on to more active and effective pollution prevention programs. This section highlights several such initiatives.

In recognition of the expanding role of trade associations in helping industries in meeting environmental goals, EPA has sponsored the Pollution Prevention Trade Association Workgroup to bring together representatives from disparate industries. The workgroup develops tools to help trade associations promote pollution prevention in their member industries, facilitates communication and information sharing between EPA and trade associations, and showcases successful pollution prevention case studies with broad applicability.³¹

Another organization with a similar mission, the American Institute for Pollution Prevention (AIPP), is a non-profit organization of professional and trade associations that facilitates effective communication and promotes emerging pollution prevention initiatives, opportunities, and practices.³² The Business Roundtable's Industrial Pollution Prevention Council also seeks projects to champion preventive approaches.

Several industries have started their own umbrella pollution prevention organizations. STEP, or Strategies for Today's Environmental Partnership, was created by the American Petroleum Institute in 1990 as a structure for measuring and reporting corporate progress in the areas of environment, health, and safety.³³

The Chemical Manufacturers Association (CMA) sponsors the Responsible Care program, which assists member companies in achieving a Code of Management Practices. Companies report implementation progress to CMA annually, in ad-

³⁰ For more information about OPPT's New Chemicals Pollution Prevention Recognition Project, contact Ken Moss (202-260-3395) or Roy Seidenstein (202-260-2252) of EPA/OPPT.

³¹ For more information on the Pollution Prevention Trade Association Workgroup, contact Leah Yasenchak, EPA, at 202-260-7854.

³² AIPP Internet site (<http://www.es.inel.gov/aipp/>)

³³ STEP Internet site (<http://www.api.org/step/ovintro.html>)

dition to conducting regular regional meetings among senior industry representatives to exchange information.³⁴

CMA member companies must make continuous good-faith efforts to attain the goals of the various codes:

1. The Pollution Prevention Code commits industry to the safe management and reduction of wastes.
2. The Community Awareness and Emergency Response Code promotes emergency response planning and encourages dialogue with plant communities.
3. The Distribution Code focuses on employee and public risks from the shipment of chemicals, and applies to the transportation, storage, handling, transfer and repackaging of chemicals in transit.
4. The Product Stewardship Code manages chemicals from initial research through recycling and disposal.
5. The Employee Health and Safety Code protects employees and visitors at plant sites.
6. The Process Safety Code is designed to prevent incidents and accidental chemical releases at plant sites.³⁵

Northeast Business Environmental Network

Established in 1994, the Northeast Business Environmental Network (NBEN) is an example of companies creating their own self-help network to promote pollution prevention among the businesses of their local communities. NBEN's members range from large companies such as Raytheon and Gillette to small "mom and pop" print shops and jewelers. Each company joining the network makes an explicit, long-term commitment to seek and implement solutions that promote pollution prevention within their own business communities. The network is self-supporting through the dues of its members and holds monthly meetings.

NBEN grew out of the Merrimack Project, a demonstration project developed under EPA's Industrial Pollution Prevention Project. Its function is to provide a forum in which members can communicate with government and environmental advocates, as well as share pollution prevention information. NBEN currently has 53 members and is sponsoring workshops on watershed tools as well as Best Management Practices, on the Internet.

³⁴ CMA Internet site (<http://es.inel.gov/program/regional/trade/cma-rprt.html>)

³⁵ CMA Responsible Care Homepage (<http://www.cmahq.com/rescare.html>)

American Textile Manufacturers Institute

The American Textile Manufacturers Institute (ATMI) is a national trade association for the domestic textile industry. Member companies process approximately 80 percent of all textile fibers consumed by mills in the United States. ATMI launched the Encouraging Environmental Excellence (E3) program in March 1992 to demonstrate an industry-wide commitment to environmental preservation and strategies for new environmentally friendly manufacturing processes and products. E3, a voluntary program, calls for textile companies to adopt a 10-point plan, which includes a corporate environmental policy statement, a detailed audit of facilities, an outreach program to suppliers and customers that encourages pollution prevention, recycling, establishment of corporate environmental goals, and the development of employee education and community awareness programs. Specifically, the program calls on companies to establish annual pollution prevention goals and target dates for air, water, solid waste, and energy. Each company must report annually on its successes and failures in achieving its goals.³⁶ ATMI was recognized in 1996 for its efforts to promote the WasteWi\$e program and encourage waste reduction among its membership.

In 1994, several companies participating in the E3 program recorded accomplishments in achieving their pollution prevention goals. For instance, Burlington's Denim Division made some changes in the dyeing and finishing chemicals it uses (i.e., elimination of free sulfurs in dyeing, reduction of indigo and dye with a sulfur odor). Other manufacturers developed new environmental product lines, such as Avondale Mills and Doran Textiles, which are offering organically grown, naturally colored cotton specialty apparel lines.³⁷

Great Printers Project

In 1992, EPA received a request for assistance in evaluating product environmental claims from the Printing Industries of America (PIA). Through the involvement of EPA's Design for Environment (DfE) Program, two pollution prevention projects evolved. Each project was directed towards a different aspect of the printing industry: the screen printing sector and the lithography sector. The Screenprinting and Graphic Imaging Association played an important role in the development of the DfE Screen Printing Project.³⁸

In August 1993, a cooperative effort called the Great Printers Project was launched to make pollution prevention a standard business practice in the entire printing in-

³⁶ American Textiles Manufacturers Institute. *America's Textiles: Encouraging Environmental Excellence*.

³⁷ American Textiles Manufacturers Institute. ATMI speech at the Green Business Conference (April 7, 1995).

³⁸ EPA. "Enviro\$en\$e DfE Fact Sheet: Screen Printing Project on Designing Solutions for Screen Printers" (EPA 744-F-95-003, March 1995).

dustry. The project is a partnership of the PIA, the Environmental Defense Fund (EDF), and the Council of Great Lakes Governors. A project team of Great Lakes regulatory agencies, EPA, printers, print buyers, printing industry suppliers, technical assistance providers, environmentalists, and labor are implementing recommendations to prevent pollution and waste from solvents used in cleaning, waste ink, and photoprocessing materials, while enhancing industry growth.³⁹ For example, in 1995, with funding from EPA, the Great Printers Project launched the Printers National Environmental Assistance Center in 1995 as a small business compliance assistance center.

Reaching Suppliers and Customers

One way to reach out to customers is by enacting a product stewardship program. The term “product stewardship” refers to practices where manufacturers essentially become stewards of industrial products by retaining responsibility for their products until those products reach the end of their life or are reused. Product stewardship practices are increasingly common in industry for a number of reasons, not the least of which is minimizing environmental liability. Key to the development of product stewardship programs is the realization that suppliers and customers are integral links in the life cycle environmental impacts of a company’s products.

In this section, we provide some successful examples of companies that have worked with their suppliers and customers in preventing pollution.

Digital Electronics

In recent years, the computer industry has developed a reuse and recycling program worthy of mention for its originality in coupling a unique customer service with pollution prevention. As an example of a firm which practices this recycling service, consider Digital Electronics. Digital’s “Computer Asset Recovery Service” is a prime example of a corporation extending the life cycle of a product. Because of the fast-paced innovation in computer technology today, computer users tend to replace their equipment frequently. This used to mean that they threw away their computers frequently. Today, Digital’s commercial customers can return their used computers to Digital, which assumes “ownership” of the aging or obsolete computer equipment, meaning that it accepts liability for the material under the Resource Conservation and Recovery Act (RCRA). RCRA stipulates that if a discarded material causes problems in a landfill and the ownership can be traced, then the owner of the waste is responsible for the problem and its consequential cleanup. By assuming ownership, Digital Electronics assists its customers in preventing the disposal of hazardous computer materials.⁴⁰

³⁹ EPA, “Great Printers Project Announced,” *Pollution Prevention News* (September/October 1993).

⁴⁰ Norm Alstar. “Old PCS Are ‘Liability Scrap’, But Digital Sees Opportunity,” *Investor’s Business Daily* (November 6, 1995).

Once the older equipment is in Digital's hands, the company attempts to sell second-hand any computers or computer parts that are in decent working order. The computer equipment left over from this process are "demanufactured" — the pieces are broken down into the most basic elements (mercury, gold, steel, aluminum, glass, and plastic) and then recycled. The remaining waste, totaling approximately one-half of one percent of the original, is properly disposed of in a landfill. Digital Electronics shares the profits from the selling and recycling processes with clients, creating a "win-win" arrangement for both parties, as well as reducing the toxic load on the environment.⁴¹

Walt Disney Company

Purchasing agents at the Walt Disney Company have gone on record with vendors and suppliers that the company "insists whenever possible" upon purchasing products and services that are environmentally appropriate. This policy has manifested itself in everything from the purchasing of bulk food products to printing millions of brochures, pamphlets, maps, and other documents on recycled paper. The company believes that in some cases it has actually driven the market, not only towards the use of recycled material, but also towards packaging and product minimization. One outgrowth of Disney's environmental purchasing policy is the replacement of Luan plywood, a product derived from tropical rainforests, with a product made from waste wood. The Walt Disney Company was recognized in 1996 by the WasteWi\$e Program for its Comprehensive Waste Reduction Program.

Because Disney is a leader in the entertainment field aimed at young people, it has a unique opportunity to foster an environmental conscience in its young customers. For example, the Walt Disney Studio works with the Environmental Media Association in an effort to include environmental messages in film and television programming. These messages have appeared in episodes of the *Golden Girls*, public service announcements entitled *Disney's Magical Moments*, *Medicine Man*, the award winning *This Island Earth*, *Dinosaurs*, and, more recently, *Disney presents Bill Nye the Science Guy*.

Other environmental education projects managed by the Walt Disney Company include the following:

- Developing, together with several participating agencies and organizations, a community program to introduce urban youth, ranging in age from 8 to 12, to a neighborhood camping experience. The program will kick off at City of Los Angeles parks and will include programs in wildlife observation, environmental resources, community service, and introductory camping.

⁴¹ Digital Equipment Corporation. "GSA Selects Digital for the Environmentally Safe Disposal of Government Equipment," *Digital Press and Analysts News* (July 12, 1996).

- Jiminy Cricket's Environmental Challenge Program. This cooperative learning venture promotes environmental education to all fifth grade classes in California public schools. The challenge recognizes and honors those students and teachers who demonstrate the leadership, creativity, and dedication needed to promote thinking and acting environmentally.⁴²

Donlar Corporation

Donlar Corporation has developed a product that embraces the product stewardship ideal. The company manufactures thermal polyaspartate (TPA), a biodegradable alternative to the polymer polyacrylic acid (PAC). Two manufacturing processes are used to make TPA. The first process, a two-step system, is 97 percent efficient and produces condensated water as its only waste stream. The second method uses a recoverable catalyst, which minimizes the amount of created waste. These manufacturing processes are excellent examples of pollution prevention in industrial design.

TPA's end uses exemplify the concept of product stewardship. In the agricultural sector, it improves fertilizer management by increasing plant nutrient uptake, yet does not place an additional burden on the ecology of the land. It can also be used as an alternative to PAC in the water treatment industry as well as the oil and gas production industry, due to its scale and corrosion-inhibiting properties.

The designers of this polymer integrated pollution prevention into every aspect of their product, and were duly rewarded with the Presidential Green Chemistry Challenge Award.⁴³

Making the Most of Community Involvement

Sue Hall of Strategic Environmental Associates has argued that market restructuring offers businesses a rather stark choice:

They can choose to deny the reality and continue with business as usual, rather than innovating to create more sustainable products and services. In this case, their businesses will continue to cause environmental problems, fueling the market restructuring and ultimately creating a downward competitive spiral for the company. Or, a company can decide to learn from others ... in order to create more sustainable products for its core businesses.⁴⁴

⁴² The Walt Disney Company. "The Walt Disney Company Environmentally Significant Activities".

⁴³ EPA. The Presidential Green Chemistry Challenge Awards Program: Summary of 1996 Award Entries and Recipients. (EPA744-K-96-001, July 1996.) pp.5-6.

⁴⁴ Sue Hall. "Sustainable Partnerships" *In Context: Business on a Small Planet* (No. 41, Summer 1995).

The following are examples of companies that are working with and learning from their communities and stakeholders.

Church & Dwight

Church & Dwight is one example of a company that has gained considerable market share by working with its environmentally-conscious stakeholders. Church & Dwight is the maker of Arm & Hammer baking soda. Church & Dwight's interest was piqued when members of Canadian environmental groups asked the company why it was not educating consumers about baking soda's use as an alternative, non-toxic cleaner. Three years later, baking soda sales had risen 30 percent, in an industry in which sales had been stagnant for decades. After this experience, Church & Dwight began to deepen relationships with stakeholders — including environmental groups, educators, the media, and regulators. The company patented a new product line of industrial cleaners following suggestions from stakeholders that Church & Dwight investigate baking soda as a replacement for the toxic solvents used to clean printed circuit boards. An analysis of the usefulness of the stakeholder approach from a financial perspective found that the company's stakeholder process added \$10 to the top line for every dollar invested in it — as opposed to \$4 for a traditional marketing program.⁴⁵

Ciba-Geigy (San Gabriel, Louisiana)

The Ciba-Geigy San Gabriel plant is a highly automated chemical process complex operated by Ciba's Crop Protection Division. The continuous herbicide production process at San Gabriel produces more herbicides than any other manufacturing plant in the United States. In addition, the Textile Products Division operates a multipurpose dyestuffs facility on the site. This facility has developed an extensive community and employee outreach program. For eight years, the facility has conducted a survey of East Iberville Parish residents asking general and specific questions on local problems, pollution, employment, emergency response, education, public perception, etc. The facility also has developed a series of community outreach programs — a Citizen's Advisory Panel, a community newsletter, an Odor Response Program, and a Summer Teachers Program. A Ciba Ambassadors Program addresses employees' environmental concerns, and trains and encourages employees to answer questions on environmental issues, including pollution prevention and waste management.

The San Gabriel plant is conducting a pilot project under EPA's Environmental Leadership Program in which it will evaluate its community involvement program and identify the program elements other companies may include in their environmental education and outreach programs to build trusting relationships.

⁴⁵ Ibid.

Selling Environmentally-Preferable Products

Years ago, product labels rarely provided more information than the brand name of the product. Today, grocery store customers walk down aisles turning product packages upside-down looking for nutritional information. Increasingly, these customers will be doing the same looking for information on a product's environment impacts — ranging from toxic chemical effects on health to energy use to recycling and disposal.⁴⁶

The question of what makes a product “greener” or environmentally more preferable to another is a source of much debate and legitimate confusion. Some pollution prevention practitioners have found that the complicated practice of life cycle assessment can highlight environmental tradeoffs associated with products. Life cycle assessment is a technique for assessing the various environmental impacts associated with a product. The assessment involves taking an inventory of environmental effects during the various stages of a product's “life cycle” — from use of raw materials such as energy, minerals, or water, to packaging to waste management — and then assessing the impacts of these inventoried effects. Whether life cycle assessment can be developed to the point that it can serve as a practical guide to determining the overall environmental preferability of products is as yet unclear. In the meantime, two independent organizations, Green Seal and Scientific Certification Systems, have built businesses judging environmental attributes of products and allowing those judgements to be displayed on product labels.

While debate continues over what makes a product “green”, it seems that an increasing number of consumers are taking environmental considerations into account when they shop. A recent survey found that the environmental record of a company ranks as an important factor in brand choice for 14 percent of American consumers, behind brand loyalty, price, quality reputation, and how well the product is advertised.⁴⁷ One industry analyst interprets these findings to indicate that environmental benefits represent second-tier purchase criteria, which can break ties in purchase decisions when brands are at price/quality parity.⁴⁸ Increasingly, it appears, companies are responding to this market force. The following are several examples of this trend:

The Henkel Company

The Henkel Company is one of Europe's largest chemicals and detergents companies. In the late 1970s, Henkel began to notice a rising concern in West Germany surrounding the potential impact of phosphates in detergents on rivers and streams.

⁴⁶ See Chapters One and Three of this report for a discussion of how federal consumers are applying their purchasing power to create a demand for products and services that have a reduced impact on the environment.

⁴⁷ Roper-Starch survey.

⁴⁸ Personal conversation with Frank Consoli, President and Founder of the Consoli Consulting Company and a leader in the field of life cycle assessment, March 1996.

At the time, Henkel manufactured 50 percent of the country's phosphates and sold 49 percent of its phosphate-based detergents. Instead of attempting to downplay the problem, Henkel decided to invest in finding a substitute for phosphates. The company's search for a substitute was successful; it patented *zeolite* and became the first consumer products company to introduce phosphate-free detergents in Europe, entirely replacing all its old product lines. As a result, the company increased its market share from 16 percent to 23 percent for its top brand in Germany and strengthened its foothold in the French market, gaining a 6 percent share for its new phosphate-free brand.⁴⁹

Wellman, Inc.

Wellman, Inc., one of the largest plastics recycling companies in the world, was able to gear its services towards the future by creating a market for PET, a recyclable plastic. Initially, the company teamed up with bottle producers, such as CocaCola and Pepsi Co. (Pepsi Cola Bottling Company), to provide recycling for the plastics they had been accumulating from Bottle Bill states.⁵⁰ By tapping into this demand for recycling, Wellman sustained a 40 percent growth rate and a 21 percent return on equity over a 6-year period. Once Wellman's recycling competitors began to vie for a share of this market, Wellman again thought ahead and expanded the business to include an outlet for the recycled PET plastic: the synthetic fiber industry. This action not only opened up a wider customer base for Wellman, but also allowed consumers the choice of buying products containing recycled plastic.

Miles, Inc.

The Miles, Inc. company, based in Pittsburgh, Pennsylvania, has developed a polyurethane paint that allows repainting of bridges and other steel structures without the need for hazardous abrasive blasting operations to remove toxic lead-based paint. The benefits of this new paint include reduced occupational exposure to lead, less environmental contamination, and less generation of hazardous waste. In addition, with less surface preparation required, companies that repaint bridges considerably reduce costs. This innovation also gave Miles a unique competitive advantage in projects involving state highway departments and their contractors at a time when regulations affecting bridge repainting were on the horizon.⁵¹

⁴⁹ Sue Hall, "Sustainable Partnership." *In Context: Business on a Small Planet* (No. 41, Summer 1995).

⁵⁰ The Bottle Bill requires states that pass this legislation to have beverage vendors be responsible for their containers, once the consumer turns the container in for a rebate.

⁵¹ Young, Ambrose, and Lobo, *Stirring Up Innovation: Environmental Improvements in Paints and Adhesives* (INFORM, New York, NY, 1994).

Innovative Ideas

To conclude this chapter, we present a list of innovative ideas that industry has developed in recent years to promote pollution prevention. The usual disclaimers apply — not all of these ideas will storm the marketplace, some may already be obsolete, and EPA does not endorse any commercial products. But the range of possibilities and achievements cited here in terms of new and cleaner processes, products, and technologies is worthy of note.

Conserving Water by Changing Services

Developed by: Harrah's Hotel and Casino, Las Vegas, NV

The idea: Allow customers who stay more than one night to decide whether or not they want their sheets changed daily. Previously, it had been the hotel's standard operating procedure to change and wash 1800 sets of sheets every day, assuming that customers wanted this service. The energy management team developed a flyer which stated the hotel's environmental policy and notified guests that if they still wanted their linens changed daily, they should call and request it. In response, the majority of guests opted not to have their linens changed daily. This change in hotel policy saved the hotel \$70,000 in energy and water costs the first year, as well as reducing the pollutant loading at the wastewater treatment plant and increasing the longevity of the sheets.⁵²

Cost Reduction through Solvent Substitution

Developed by: Martin Marietta's Astronautics Group, Denver, CO

The idea: Phase-out the use of two chlorinated solvents and a toxic chemical used in hand-cleaning operations. The group first substituted Daraclean 282 for 1,1,1-trichloroethane, which was used for rocket component degreasing. After incurring \$270,000 in up-front costs, the company saved \$600,000 annually. Additional bonuses are the increased cleaning ability and the recyclable characteristic of the new solvent. The next solvent to be eliminated was CFC-113, which was used to clean spacecraft components. The replacement was an alcohol-based spray that saved the company \$325,000 a year, with a payback period of 4 years (the start-up costs were \$1.3 million). The last solvent changed was a toxic chemical used to clean aluminum before adhesive bonding occurred. The switch to a citrus-based solvent saved the company \$250,000 annually, reduced toxic emissions by thousands of pounds, and improved worker satisfaction — it smelled more pleasant and worked better than the old solvent.⁵³

⁵² Romm, Joseph J. *Lean and Clean Management*. (Kodansha International. New York, NY, 1994).

⁵³ *Ibid.*

The Cascade Approach for Water Conservation

Developed by: Buckeye Cellulose Corporation, Flint River Plant, MI

The idea: Use a cascade approach for water, in which it is routed “through processes requiring the purest water to those requiring successively less pure water.” This process change reduced the plant’s demand on the municipality’s water resources and reduced the amount of wastewater requiring treatment. The company also altered their method for transporting reject wood scraps. Instead of using water to transport the wood scraps to a press and ultimately landfilling the waste, there is now a closed-loop system for refining and recycling the rejects. This process change reduces the amount of wood being landfilled and reduces the biological oxygen demand (BOD) in the water used for transport. Previously, water used to transport wood rejects incurred a high BOD from microbial activity from the wood itself. The BOD loading in the water made the water increasingly difficult to treat at the wastewater treatment facility. With a closed-loop system, Buckeye was able to reduce BOD in their wastewater to one of the lowest levels in the industry.⁵⁴

Environmental Reengineering in the Citrus Industry

Developed by: Regal Fruit Co-op, Tonasket, WA

The idea: Examine the energy use of its fruit storerooms, which store produce at 31° to 32° F in an almost pure nitrogen environment, with fans running continually. Upon further investigation, it was discovered that the cooling system was counteracting heat produced by the fans. By installing a computer-controlled monitoring system, the fans would run 75 percent less and create much less heat — realizing a total energy savings of more than \$17,000 annually. The company also realized further energy savings by reducing the amount of oxygen in the storeroom. Increasing the nitrogen level allowed for increased storage temperature (and consequently less load on the cooling system) as well as better quality fruit, which increased the profitability of the company.⁵⁵

From Bigger to Smaller in Hazardous Waste Generation

Developed by: Echo Bay/Cove Mine

The idea: Reduce use of halogenated solvents by identifying solvents that were not considered to be Toxicity Characteristic (TC) chemicals and develop a filtration system to recycle the new solvent. The company screened all potential solvents to determine those that would give an acceptable level of cleaning for parts washing, had a flash point above 140°F, did not have a RCRA hazardous waste code, would not oxidize parts, were not costly, could be filtered onsite, were easy to handle, and did not contain halogenated or EPA TC constituents. Although the replacement solvent was

⁵⁴ Ibid.

⁵⁵ Ibid.

more expensive than the halogenated one, costs were not prohibitive for the company because the new solvent could be recycled. A filter system based on a high-flow pump, stainless steel screens, and a paper filter was used and had the additional advantage of also absorbing and reducing the heavy oils in the used solvent. This new system required an initial investment of \$11,400, but the return on investment was 154 percent with a payback period of less than 18 months. Most of the annual savings of \$9,300 was in the form of reduced solvent costs. This system not only reduced the toxicity of the waste but also permitted Echo Bay/Cove Mine to change its status from Large Quantity Generator to a Conditionally Exempt Small Quantity Generator with reduced regulatory requirements and environmental liability for a cost savings of \$16,000 per year because of fewer training needs.⁵⁶

Newspaper Recycling of Waste Ink

Developed by: The Hartford Courant

The idea: Purchase an ink recycling unit in order to eliminate the generation of hazardous waste inks and reuse the recycled ink in lithographic printing operations. The waste ink is collected in a storage tank, then run through the recycling unit to produce a reusable black ink. The recycling unit uses a vacuum distillation, filtration, and blending process. The reusable black ink is mixed with virgin ink to the desired property. The solvent present in the waste ink is recycled and, therefore, only water and paper-dust paste are present in the recycling wastestream, which is no longer considered to be hazardous because the heavy metals and solvents are no longer present. The company moved from having a 12,000 lbs/year hazardous wastestream to a 1,500 lbs/year nonhazardous wastestream.⁵⁷

New Soldering Process for Circuit Boards

Developed by: Motorola Government Systems and Technology Group

The idea: Eliminate the use of chemical rinses containing ozone-depleting substances when preparing metals for soldering. Working with the Department of Energy, Motorola developed a soldering process that eliminated the need for chemical rinses after the use of a chemical flux to remove oxides from the metal surface. The new process replaces the flux with a mixture of adipic acid, a nontoxic organic acid, in isopropyl alcohol. The mixture is sprayed onto the circuit boards that are passed through an inert gas section of a wave soldering machine. This prevents oxide formation during the heating of the board to soldering temperatures. When the board then passes onto the liquid wave of solder metal, the adipic acid acts as a scavenger for the oxides. The only waste products of the system are carbon dioxide and water vapor. No further cleaning of the boards is required as no corrosive residues are formed. This process

"Remarkably, our scientific team found a way to dissolve high performance vegetable oil based ink with a simple water solution. Now water and oil do mix."

— Tom Rifkin,
Deluxe Corporation

⁵⁶ EPA. *Pollution Prevention Success Stories* (EPA/742/96/002, April 1996).

⁵⁷ Ibid.

⁵⁸ Ibid.

has eliminated the previous use of 48 tons of chlorofluorocarbons and trichloromethane per year. Although the new machines require a significant capital investment, conventional wave solder machines can be retrofitted at a much reduced cost.⁵⁸

UV Coating to Cure Cans

Developed by: Coors Brewing Company

The idea: An alternative to current methods of decorating the 100 billion aluminum cans produced annually, which does not result in VOC emissions. The technology uses UV light to cure the decorative image on the exterior of aluminum beverage cans, rather than curing the cans in a gas-fired oven. Separate UV “fountains” supply the ink to rollers, which coat individual plates. The plates, one for each color used, are raised positive images of the graphic design to be printed on the cans. Clean cans are fed into the printer and placed on a rotating steel mandrel; in rotating the can body against the rotating blanket, the graphic image is transferred to the can. The cans are transported to the UV oven for curing with UV light. Overall energy costs are significantly lower for the UV curing than for conventional thermal technology if air emission controls are factored in, and fewer VOCs are emitted.⁵⁹

Printwise™

Developed by: Deluxe Corporation, St. Paul, MN

The idea: A system that eliminates petroleum-based solvents and their related VOCs from the lithographic printing process. These solvents, generally consisting of 100 percent VOCs, have traditionally been used to clean ink from press components. The resulting “press washes” are considered by EPA to be a significant source of VOC emissions. The Printwise™ ink is 100 percent vegetable oil-based and matches or exceeds conventional inks in press and printing performance. Most important, the ink includes a solubility conversion mechanism that enables it to be cleaned with a simple, VOC-free water solution. Deluxe’s breakthrough resulted when corporate scientist Tom Pennaz began regarding lithography as a system in which ink and solvents act as interdependent, not independent, elements. Pennaz developed a solubility conversion mechanism that he incorporated into traditional ink formulations. Acting as a “key,” the solubility mechanism locks the oil-based Deluxe ink during printing but can be unlocked and converted to a water-soluble state during cleanup. As a result, although the Deluxe ink remains truly lithographic, it requires a water-based, VOC-free solution for cleanup.⁶⁰

⁵⁹ EPA, *Pollution Prevention News* (May-June 1995). Featured in U.S. Department of Energy’s Innovative Concepts Fair, April 1995.

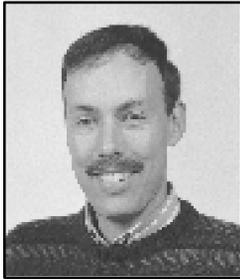
⁶⁰ EPA, *Pollution Prevention News* (June-July 1994).

Conclusions

Six years ago, pollution prevention in industry was the province of a handful of leaders and visionaries, mostly in a few large corporations. That vision has spread to a much larger universe of firms across a wide range of industries. EPA's early voluntary industry programs, 33/50 and Green Lights, were instrumental in setting up a framework for companies to act positively and cooperatively with EPA in undertaking pollution prevention measures.

Companies appear to be motivated to adopt pollution prevention innovations by a combination of factors. Some are attracted by perceived economic benefits, either in the form of cost savings or increased market share. Some respond to the threat of government regulation, still others to the willingness of regulators to be flexible. Some companies are motivated by customer demand for "green" products; others by public attention to their polluting practices. Thus, both the carrot and the stick seem to be effective for different companies. And just as responses to incentives differ, so do the ways in which different businesses undertake pollution prevention measures. This chapter has offered a glimpse of the manifold innovations and opportunities open to industry in pollution prevention.

Among the challenges that lie ahead, three in particular stand out: achieving a more widespread use of environmental accounting to ensure that corporate management is fully aware of the costs of pollution and waste; disseminating information and technical assistance to small and medium-sized firms in order to increase their participation in pollution prevention; and harnessing purchasing power of consumers to drive the market towards environmentally-preferable products.



Comments on the Current and Future State of Pollution Prevention

by

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As we review environmental progress during the past decade, industry can look back with satisfaction on its accomplishments in reducing waste and emissions. Through practice of pollution prevention, companies have enhanced their relationships with local communities, improved their products for their customers, and made real environmental improvements. Significantly, many companies have done all of this while improving their bottom line business results. The positive results achieved so far are a good beginning, but much more remains to be done by industry in order to approach the full potential for combined business and environmental improvements. DuPont Chairman, Ed Woolard stated, "Our most difficult challenge continues to be eliminating waste at the source. This area also represents our biggest opportunity for business improvement since every pound of waste represents a pound of ingredient that has not ended up as a high-value product even though it should."

The most significant change that has occurred in industry since the Pollution Prevention Act was adopted in 1990 is not a new system or new technology, but rather a change in attitude. There is a rapidly growing realization by companies that they can no longer afford to view the environment and business as two different topics, let alone two competing topics. Thousands of large and small companies are establishing demanding waste and emissions reduction goals, enlisting in voluntary programs, and publicly reporting their progress. Once they commit to a goal, company leaders are challenging employees to meet and exceed their public commitment in a way that saves both money and valuable resources. Numerous success stories have been published by the States, the EPA, and private organizations. They describe hundreds of innovative solutions to difficult waste problems, resulting in millions of dollars of cost savings and revenue increases, often for minimal or no capital investment. Sharing these stories has served to energize, educate and enable other companies to build on these efforts.

The key to future success lies in cooperative efforts involving companies, local communities, regulatory agencies, and environmental groups. This is the best way to create needed environmental improvements while at the same time strengthening the competitiveness of U.S. industry in a global marketplace. Voluntary programs such as EPA's 33/50 Program of waste and emissions reductions have demonstrated that outstanding environmental and business benefits can be achieved in a spirit of partnership and cooperation. The 33/50 Program has served as a valuable tool to help focus, prioritize and measure waste and emissions reduction efforts. The national attention accorded the 33/50 Program has helped companies like DuPont to sustain and accelerate their waste and emissions reduction efforts.

National programs such as 33/50 will and should continue to play an important role in future pollution prevention efforts. However, increasing attention is being given to partnerships with the local community as businesses direct their attention to the concept of sustainable development. Through national programs and local partnerships, companies have made great progress in eliminating waste at the source, increasing recycling of waste and post-consumer materials, and developing products and packaging with greatly reduced environmental impacts. At

DuPont, our ultimate objective is to operate in harmony with the community, in boundary-less plant sites where information, understanding, concerns and people flow freely between the plant and its surroundings. Economic growth, environmental protection, and strong educational systems must be addressed together as part of a vision of local sustainability.

EPA can benefit both industry and communities by providing a framework and tools for setting priorities for future pollution prevention efforts. This must start with a sound scientific assessment of which sources of waste and emissions are of greatest concern to human health and the environment. Priority-setting must be done through an open and cooperative dialogue, with the agency, affected industry, community members, and environmental groups participating. An example of a current effort is EPA's Waste Minimization National Plan, which has focused attention on persistent, bioaccumulative, and toxic compounds and targeted them for voluntary reductions. As part of the process of developing the National Plan, stakeholder meetings involving industry, states, and public interest groups were held to provide opportunities for input and dialogue.

EPA and state regulators must seek opportunities to provide industry with the flexibility to adopt pollution prevention solutions as alternatives to end-of-pipe controls. Two concerns are paramount: (1) provide ample time to investigate and implement innovative source reduction alternatives versus end-of-pipe controls, and (2) make regulations performance-based rather than mandating specific technologies. In some cases, new regulations are continuing to drive industry to invest their limited capital dollars in expensive end-of-pipe control technology. However, EPA's Permits Improvement Team has offered a new paradigm for reinventing the permitting process. Their proposals would enable and encourage greater adoption of source reduction methods while at the same time offering industry the flexibility to grow and make operating changes at the rapid pace needed to succeed in a competitive global marketplace.

Industry must provide the leadership and innovation to create a step change in our approach to protecting the environment if we are to achieve our vision of a sustainable future -- a clean environment and healthy economic development. Industry must continue to share its accomplishments and build on the successes and learning of others. Communities, large and small industries, regulatory agencies, and educators must form partnerships to establish priorities for accelerated progress. States and federal regulators must continue to shift their emphasis from end-of-pipe command and control regulations to promoting pollution prevention through flexible, voluntary programs, information sharing and recognition of successful efforts. There is much hard work to be done, but our efforts will ensure positive results for ourselves and future generations.



The Dow Chemical Company

by

Craig Doolittle

Manager, Pollution Prevention Issues

The Dow Chemical Company

Midland, Michigan

Industry in the 1990s is once again a focal point for environmentalism. This time, however, U.S. industry has a challenge to be competitive in a global market while at the same time, it has the opportunity to play a leadership role in advancing efforts to prevent pollution and waste. As the global marketplace rapidly expands, multinational businesses find themselves in a unique position to advocate and catalyze responsible and sustainable growth at home and overseas. While striving to balance the need for mandated environmental controls with the entrepreneurial needs of free enterprise in the United States, industry must leverage and integrate pollution prevention concepts across its operations and businesses globally.

It is clear that waste cannot be tolerated in our operations if we are to stay in business in the twenty-first century. While this is not exactly a revelation, the idea takes on special meaning in the context of the changing and expanding marketplace. The new competitive business reality brings the weight of market forces to bear on environmental progress. Industry can use its expertise and resources to eliminate waste and increase productivity, while increasing the growing demand for our products worldwide. How industry actually manages the change to more efficient production and use is the key to whether we will actually be sustainable.

Industry not only has the opportunity to lead pollution prevention, we also have the motive and the tools to make it a reality. Our motive is simple: to survive, we must provide the lowest-cost, highest-quality products and services. Our customers expect this more than ever before. Our shareholders want increased profitability and productivity. At the same time, society calls for continuous improvements in our environmental, health and safety performance. How do we assure all needs are met? By using the tools at our command to make cost-effective pollution prevention an integral part of what we do and how we think both individually and as a corporation.

Tools for Responsible Growth

We have several tools to help us manage sustainable growth in a responsible manner. One such tool is standardization. We can apply the same state-of-the-art technology for manufacturing polystyrene, whether in Joliet, Illinois, or Map-Ta-Phut, Thailand. A network of global technology centers ensures that our sites utilize the latest innovations to maximize productivity and limit waste. We are also working to standardize our operating practices, to ensure each pound of polystyrene (or other Dow product) is made with the same attention to quality, environmental protection, safety and health, no matter where it's made.

Plant engineering and design can further drive "resource productivity," which basically means making more with less. We strive to make every new plant we build the best one we have ever built in terms of both process engineering, design and environmental, safety and health impacts. For example, an \$800 million expansion of our site at Fort Saskatchewan, Alberta, Canada, includes a new closed-loop system that prevents the hydrocarbons plant from sending any process waste water to the nearby river. This is the first plant of its kind in the world.

Another business tool called “activity-based costing” (ABC) also can help businesses identify areas where resources are being wasted. Simply put, ABC assures that all the present and future costs of making our products is considered in determining that product’s profitability. For example, ABC asks each business to factor in the future costs of production, which may include environmental considerations such as recycling, waste disposal, treatment or remediation of future disposal. In this way, EHS costs can be accurately incorporated into the profit or loss statement for each product. This approach also supports life cycle analysis, which evaluates our products from design to disposal or recycling. These tools help us to be more competitive long-term in the marketplace.

While we talk a great deal about being more competitive by reducing waste, we also realize that there are some cases where improvements must be made to address important environmental, health or safety issues. The best example of this at Dow is our emissions reduction goal for 2005. We already reduced global emissions by 50 percent between 1988 and 1994. Further reductions to meet the new targets in our 2005 goals will require an estimated capital investment of about \$300 million over 10 years. This investment may not generate a dollars-and-cents return, but it will help us address an essential part of being a successful company by meeting the public’s expectations for lower emissions.

Integrating Strategies

The key to making some of these tough decisions is strategic integration. Companies must blend business and environmental management systems and decision-making in order to achieve pollution prevention goals. This requires a new model for business, one that merges economic and competitive reality with environmental, health and safety performance. Business and EHS management systems have often been managed separately. By fully incorporating EHS goals into business goals, product by product, corporations can make more informed decisions on where investments and resources are needed. Sustainability then becomes determinable on a cost basis.

What does the future look like? We will move further along the continuum from the end-of-pipe treatment philosophy of yesterday to today’s focus on pollution prevention -- to tomorrow’s market mandate of “resource productivity.” Our businesses cannot focus on preventing pollution for its own sake. Long-term, the question we must ask is not simply “How can I eliminate waste from this process?” Rather, it is “how can I use less raw material to make more product with less waste?” When we fully integrate this thinking into our daily life, we will have made tremendous progress along the path to sustainable development.

It’s one thing for the business community to talk about the opportunity and tools for merging economic and environmental decisions, but it’s quite another to build a regulatory system that encourages such action. Many of the laws and regulations with which businesses comply today are crafted according to the old command and control paradigm. There is often little incentive for companies to make the changes or use innovative approaches mentioned previously. In fact, regulations can discourage companies from embracing innovation and breaking from prescribed operating methods.

We need a regulatory system that is performance-based, one that allows businesses to set goals based on their distinctive set of issues and needs, while assuring the public can effectively monitor and influence that performance. One-size-fits-all regulation doesn’t match the rapid changes industry faces today. Instead, society must embrace a flexible system that asks businesses to be responsible for performance improvements and accountable for lapses in progress. Such a system requires trust and collaboration among all stakeholders: government, the environmental community, industry, and private citizens.

Slowly, we are making progress on collaboration. Today, industry is often invited to the table as policies are debated and drafted. We've worked side by side on several occasions with colleagues from the EPA and Department of Energy on initiatives to test the concept of performance-based regulation. We've had some successes, and some failures, but ultimately, our success will depend on our collective and ongoing commitment to work together.



Improving Both the Environment and Corporate Profits

by

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Industry has made great strides in reducing corporate environmental impacts from its products, processes, facilities, and other activities. Increasing numbers of companies have seen improvement in both the environment and their profitability from proactive environmental management rather than merely reacting to environmental regulations. Companies have discovered that techniques and technologies are available to improve environmental and corporate management and are beginning to use them.

Many companies have been moving swiftly to integrate the consideration of environmental impacts into all aspects of management decisions including product cost, product price, product and process design, capital investments, and performance evaluations. But this is not yet widespread. Companies are often unsure about how evaluations of changing regulations, changing environmental technologies, and changing costs of those technologies should be included in decisions. They also have difficulty evaluating the costs and benefits related to product life cycle impacts. Finally, even where techniques and technologies have been introduced in companies that both reduce environmental impacts and improve long-term corporate profitability, these techniques are often not spread among companies or even between the different business units or facilities of the same company. Sometimes this is blamed on decentralization and the inability of senior general managers or senior environment, health, and safety (EH&S) managers to motivate business unit and facility managers to institute environment protection and money-saving changes in products and processes.

Nevertheless, the techniques and technologies are available that can improve corporate environmental performance and corporate profitability--win/win modifications. In many cases, financial analysis tools that are common throughout industry are not being used in EH&S departments. In other cases, companies are being managed with a focus on regulatory compliance rather than environmental planning.

Three of the areas of corporate improvement that have significant positive impacts for both the environment and corporate profits are capital investment decision making, cost management, and performance evaluation.

Capital Investment Decision Making-- Throughout industry, techniques such as scenario forecasting, Monte Carlo simulation, decision trees, and discounted cash flow analysis are commonly used for improving capital investment decisions. Most major companies would find it inconceivable that such decisions would be made without estimating the likely future cash flow and other impacts from the investment. Significant uncertainty related to projections of sales, competition, production costs, and many other factors often exists and long time horizons are not uncommon. Nevertheless, risk and uncertainty are appropriately factored into the decision analysis and the decisions are made. However, these techniques are typically not used in environmental equipment decisions and the evaluation of quality improvements that have benefits for both the environment and

profits. Too often, companies view environmental improvements as driven by regulations and do not recognize the tremendous opportunities that are created by proactive environmental management.

Companies that conduct product life cycle assessments on a regular basis find that numerous opportunities for improvement exist and provide changes in product and process design that not only reduce waste and increase production yield, but also increase product marketability and sales. Those companies that broadly identify their stakeholders and measure their life cycle impacts gain competitive advantage through improved product and process design and reduced environmental impacts. The life cycle assessment and life cycle costing process also provides the impetus for companies to bring together professionals from many parts of the company. This cross functional approach provides the setting for consideration of the impacts of the environment on accounting, finance, product and process design, legal, operations, marketing, etc. This is often the first time that many of these professionals have been brought into the consideration of the product design early enough to have an impact. Benefits are provided to the product, to the environment, and to corporate profits.

Cost Management -- It is well known in industry that “we manage what we measure”. Unfortunately, too many companies cannot identify their total environmental costs and thus do not recognize the significant impact that those costs have on their bottom line. They also don’t recognize that many of these costs can be controlled and reduced through strategic environmental management. Companies need to identify their environmental costs, track those costs, and then determine the causes of those costs through a system like activity based costing. The life cycle assessment and life cycle costing process also provides information that should be included in the full environmental cost accounting that is necessary to dramatically improve environmental management and reduce environmental costs. By identifying the causes of the costs, products and facilities can be identified that potentially make the most significant contributions to environmental cost reduction. Without this approach, the causes of environmental costs are often not clear and cannot be effectively managed.

I have seen many companies that have dramatically underestimated their environmental costs because of inadequate costing systems and did not recognize the significant opportunities for both cost savings and environmental improvements that were available. Costs being understated by a factor of three or four is common and is caused by the tendency of accountants to place environmental costs in various overhead or general administrative expense accounts. This masking of the costs encourages the consideration of these costs as regulation-driven and does not encourage the consideration of the tremendous benefits of voluntary-driven, proactive, strategic environmental management. Full environmental costing is becoming even more critical as global industry recognizes the obligation for product take back and the ultimate responsibility for post consumer waste. Companies should be including these costs in capital investment, product-costing, and cost management decisions.

Performance Evaluation -- Through the integration of environmental impacts into capital investment and product costing decisions, managers are encouraged to consider the long term environmental and financial impacts of product and process decisions. But, if companies are to motivate proper decisions, they need to also recognize the incentives created by the performance evaluation system and make appropriate changes to encourage managers to seek win/win improvements and make the proper tradeoffs when environmental improvements have no clear business advantage. Often capital investments are discouraged by performance evaluation metrics that cause a manager to forego profitable long-term investments for increasing current period income. Furthermore, if companies want to make significant environmental improvements or change the corporate culture to encourage environmental sensitivity, an integration into the performance evaluation system is essential. Including an environmental performance metric into performance evaluations and bonus schemes can motivate changes

that are congruent with company stated goals. Both lagging indicators of performance (measures of past environmental performance) and leading indicators (environmental management systems and improvements to reduce future environmental impacts) must be included in these evaluations of performance of divisions, teams, and managers. These measures will allow companies to evaluate and motivate performance, benchmark the company's performance against its competitors, and strive for continuous improvement.

Some companies still do not recognize the benefits from proactive strategic environmental management. In many cases they don't recognize how existing measurement and management tools can be utilized to improve both the environment and profitability. The EPA could improve the environment and corporate profits through further development and promotion of the tools available for integrating environmental impacts into management decisions.

Some companies see the measurement tools that can be used to improve costing and capital investment decisions as less reliable than traditional business and accounting measurement approaches. But, this is typically not the case. Increased usage of these tools in EH&S departments will improve environmental decision making, improve the environment, and improve corporate profitability.

EPA's involvement in promoting the use of these techniques and technologies and the encouragement of full environmental cost accounting and life cycle costing to improve corporate decision making will lead both corporations and the EPA closer to their goals--the improvement of both environmental and financial performance.

